Practice and Evidence of Scholarship of Teaching and Learning in Higher Education
Vol. 5, No. 1, April 2010, pp. 33-45

Evaluating The Student Experience of Inquiry-Based Learning: An Educational Initiative

Caroline A. W. Dickson
School of Health Sciences
Queen Margaret University, Edinburgh
cdickson@qmu.ac.uk

Abstract

This paper outlines the development, implementation and evaluation of two honours level inquiry-based learning (IBL) modules, one in a pre-registration and one in a post-registration nursing programme within a modern university. Although IBL has been embraced by nursing curricula as a means of developing effective practitioners to meet the needs of a complex, changing healthcare environment, the evidence to support its adoption remains variable. The literature identifies effective curriculum design, facilitation, motivation and cooperation of learners as key in achieving effective IBL. Scenarios to stimulate IBL were developed from practice for these modules, with contributions from practitioners to ensure currency and relevancy.

Student evaluation of the modules revealed that one scenario lacked focus leading to some uncertainty for students. Both student groups encountered some anxiety, particularly during the IBL process and workload was perceived by students as heavier than for traditional methods of teaching and learning. Both groups reported effective facilitation. Although no claims can be made concerning improvement in conceptual thinking within this study, pre-registration students' assessment results in this module were higher than their dissertation module. However, post-registration students' marks were lower when compared with a previous cohort. This small educational initiative raises questions about the importance of content, inquiry process, social interaction and overall effectiveness of IBL methods.

Key words: inquiry-based Learning, enquiry-based learning, problem-based learning, facilitation, teaching and learning

Introduction

Inquiry-based approaches to learning within nursing curriculum have evolved in an attempt to meet the demands of service, where nurses are expected to be autonomous practitioners, demonstrating reflective practice, critical thinking, problem-solving and professional competence within an ever-changing, complex clinical environment (Biley & Smith 1999; Siu, Laschinger & Vingilis 2005; Lyons 2008; Beers 2005; Smith & Coleman 2008). Baker, McDaniel, Pesut and Fisher, (2007) also stress the increasing importance of working in multi-disciplinary teams, using information technology and participating in continuous quality improvement. Medical and nursing education has responded to these challenges by shifting educational strategies to student–centred, practice-based learning with an emphasis on knowledge synthesis (Lyons 2008 ; Pang et al 2002). This fits with the current move in the teaching and learning paradigm, from the traditional view of teachers having knowledge and power over students who are the recipients of knowledge, to a more contemporary view where, according to Heron (1999), 'Teaching is no longer seen as imparting and doing things to the student, but is redefined as facilitation of self-directed learning' (p 2). There is much investment within universities to adopt this teaching and learning approach, but the evidence supporting its use is variable (Smits, Verbeek & deBuisonje 2008).

The terms inquiry-based learning (IBL), enquiry-based learning (EBL) and problem-based learning (PBL) appear to be used interchangeably in the literature. A common characteristic regardless of the label when it is used in professional education contexts is that small groups of students work together on issues from practice presented in scenarios. Using problem-solving skills they identify gaps in their knowledge, research these topic areas usually individually and report back to the group. Through facilitation of inquiry, the group help each other to make sense of the evidence and use it to address the 'problem' or issue presented in the scenario. The main difference between PBL and other inquiry-based approaches is the focus on 'a problem'. This, according to Kenny and Beagan (2004) places PBL firmly within the medical paradigm, rather than the holistic paradigm underpinning contemporary nursing practice. Holism considers the whole person, mind, body and factors influencing health as opposed to merely the treatment of disease. Scenarios used in IBL and EBL help students explore issues arising from practice. These may or may not have a conclusion. For the purposes of this paper, the term IBL will be used to encompass all these teaching and learning approaches.

According to Van Berkel and Dolmans (2006; Dolmans, Wolfhagen, van der Vleuten & Wijnen, 2005 and Lyons, 2008), IBL is a constructivist approach to learning that stimulates active, self-directed, contextual and collaborative learning, based on active participation, problem-solving and critical thinking. This approach, they contend, emphasises learners' active engagement in their learning and thus in constructing cognitive networks. Cooperative learning theory reflected in IBL advocates group working where students are actively involved in the intellectual work of organizing material, explaining it, summarizing it and integrating it into existing conceptual structures. (Johnson, Johnson & Holubec, 1998) A number of studies emphasise active participation (Dolmans, Wolfhagen, van der Vleuten & Wijnen 2005; Van Berkel & Dolmans, 2006; Lyons, 2008), whilst cooperation of learners is cited in Albanese (2000) as vital to enable the construction of cognitive networks (Dolmans, Wolfhagen, van der Vleuten & Wijnen, 2005 Van Berkel & Dolmans, 2006; Lyons, 2008). This is based on the activation of prior knowledge from previous experience (Schmidt, 1983 as cited in Albanese 2000).

Some studies advocating IBL are comparative, some using validated tools to measure critical thinking, but many are based on self-scoring of students and facilitators, and are potentially open to bias. Claims that PBL develops students' conceptual understanding (Lyons, 2008), problem-solving skills, (Schmitdt, Vermeulen & van der Molen, 2006); critical thinking skills (Biley & Smith, 1999; Magnusseen, Ishida & Itano, 2000; Tiwari, Lai, So & Yuen, 2006), skills in critical reflection (Williams (2001), self-directed learning strategies (Biley & Smith 1998) and group interaction (Valle et al, 1999) articulates with the changing paradigm shift in education. There are also claims that these teaching and learning approaches develop skills for practice i.e. team working and leadership (Schmitdt, Vermeulen & van der Molen, 2006) and attitudes towards inter-professional collaboration (Goelen, De Clercq, Huyghens & Kerckhofs 2006).

The importance of attention to content, inquiry process and social interaction has been highlighted by Connelly and Seneque (1999). Scenarios or case studies derived from practice are central to IBL. The intention is to help students identify knowledge gaps and learning issues, enabling them to explore issues arising from the situation (Biley & Smith, 1999) and to make connections necessary for problem-solving. Goelen, de Clercq, Huyghens and Kerckhofs (2006) used patient interviews as triggers for their

study, while Dammers, Spencer and Thomas (2001) used case summaries of current patients and encouraged students to access patients and relevant health and social care professionals directly for further information. Cranston (2008) conducted focus groups of head teachers to develop scenarios from practice. He found that whilst this was useful for content, academic expertise was required to shape the scenarios.

The inquiry process is normally facilitated by tutors, with the aim of encouraging students to be researchers and enabling critical discussion. There are a number of concerns highlighted within the literature (Miller, 2003; Pedrosa de Jesus et al, (2004; 2006; Lyons, 2008). Tutors are concerned about the ability of the students to achieve the required depth of learning, students often present weak evidence (Yeo, 2005), fail to make connections between new and existing knowledge and fail to generate suitable hypotheses. Pedrosa de Jesus, Almeida and Watts (2004) and Pederosa de Jesus, Teixeira-Dias and Watts (2006) categorised questions asked by students into acquisition, specialisation and integration questions, as proposed by experiential learning theory. They concluded that students' questions were reflective of their learning style i.e. Surface, 'meso' or deep learning. The challenge of adopting a new learning style and the difficulty in letting go previous learning styles may be a reason for students' stress which has been highlighted in a number of studies (Biley & Smith , 1999; Williams, MacDermit & Wessel, 2003; Moffat, McConnaghie, Rss & Morrison, 2004; Yeo 2005; Barman, Jaafar & Naing, 2006). The social interaction required in IBL requires trust, but Smith and Coleman (2008) state that this may not always be present. Facilitators can also find the process stressful Dolmans et al (2001; Bowman & Hughes, 2006).

A recurring issue in the literature debates the importance of process versus subject expertise (de Grave, Dolmans & Cees 1999; Leung, Lue & Lee 2003). Tutors' teaching styles were evaluated by Leung, Lue and Lee (2003) using a 30-item teaching style inventory for tutor evaluation. This validated tool was based on both teacher team meetings and Biface (cited in Dolmans, Wolfhagen, van der Vleuten & Wijnen, 2001) and Thomas, Clarke, Pllard and Miers (2007) observed that tutors revert to more traditional assertive teaching styles which may lead to them generating learning issues instead of students and explaining the material that should have been explained by the student researching the topic area. This may also lead to a decrease in student motivation.

This paper describes the development, implementation and evaluation of two IBL modules for two full-time student groups at honours level within the subject area of nursing, in a modern university: Preparation for Clinical Leadership (PCL), a fourth year pre-registration module within the BSc(Hons) Nursing programme and Management of Long-term Conditions (MLTCs) within a post-registration BSc(Hons)/PGCert Community Health Nursing programme. Inquiry-based learning fits with the philosophy of both programmes and the Quality Enhancement of Teaching and Learning Strategy of the University where the modules were delivered.

Development and implementation of the modules

Inquiry-based teaching and learning methods are well established within the BSc (Hons) Nursing programme, with a number of staff experienced in facilitation. The BSc(Hons)/PGCert Community Health Nursing programme team had not utilised this approach prior to implementation of MLTCs (Management of Long-term Conditions). Novice facilitators observed experienced facilitators prior to module implementation and assisted in module development. Both modules reflected a hybrid IBL approach as highlighted by a number of authors including Nieminen, Sauri and Lonka (2005) who designed a 5 week IBL course and Streichert et al (2005) a short 5 day hybrid IBL course with a mix of group working focussed on scenarios and expert lectures. The scenario for MLTCs was generated from practice, with the help of practitioners and was based on a patient discharge summary.

The PCL (Preparation for Clinical Leadership) scenario was generated from the experiences of the teaching team in practice and reflected a team charged with implementing change in practice. Ten pre-registration students met in groups twice per week for 10 weeks in PCL. There were 6 expert lectures from practitioners. Eleven post-registration community students met once per week over four weeks for MLTCs module. There were four expert lectures, including a session where a patient relayed his experiences of health and social care. At the beginning of both modules introductory sessions were presented to outline the module structure and process and to establish roles and expectations. Both modules were assessed by e-portfolio.

Evaluation

Evaluation forms were distributed to students via email following submission of students' assessment portfolios. Eighty per cent (n=8) PCL and 82% (n=9) MLTCs students completed the forms. Qualitative and quantitative data was obtained around the scenario, the group process, the role of the facilitator, the expert lectures, comparison between this teaching and learning approach and more traditional approaches to learning. Statistical data was analysed and a thematic analysis of qualitative data carried out. All MLTC students and 50% PCL student felt the scenarios helped to identify their learning gaps. One student commented, *'the scenario did provide us with ideas at the beginning, but it was very vague. It was mainly the outcomes [of the module] that we focussed on more.'* Whilst participation was good in MLTCs group, there were some issues with participation within the PCL group. 50% of students felt that not all participants participated equally. One student commented, '*there were issues that cropped up frequently and I think individuals put up barriers, maybe due to the difficultness of the module or due to the individuals that we are'.* Issues were also raised around the quality of evidence presented,

> *'[some] group members submitted unreferenced work which incidentally came from Wikipedia. I felt this was unfair as I had always put a high effort and quality into my work. This was an area I felt had been overtly addressed in the class however was never resolved'.*

One student revealed*, 'I will be honest, I did my best to participate in discussion but there were times I was cheesed off and didn't fully participate.'*

All participating MLTCs students and 60% (n=6) participating PCL students considered facilitation to be helpful and appropriate. One student commented, *'at the beginning I didn't think it helped our group work, but by the end I thought it was an effective process and helped us greatly'.* All students in both modules found the expert lectures useful. Although PCL students had previously encountered IBL, one student expressed the view*, 'the lectures helped put everything that we had learned from PCL into context'*. Another student stated, *'this is where a lot of my own personal learning came from'* and another thought, *'the lectures should have been at the beginning of the module before the group work started'*. Paradoxically, students were asked how this approach to teaching and learning compared to more traditional methods, and all comments were

positive. Students on MLTCs module found this new way of learning difficult at first, but appeared to enjoy and benefit from this approach. Both groups identified the workload was heavy, particularly due to competing priorities.

Engagement with the process was reflected in attendance at both modules. While attendance was generally good - 100% in MLTCs, within PCL, three students only attended 10 out of 16 sessions (64%). Dolmons, Wolfhagen, van der Vleuten & Wijnen (2001) summatively assessed attendance rates and participation, but concluded that this may have lead to reduced motivation. They propose evaluation throughout the module (or process) as an alternative. Fourth Generation Evaluation: Claims, Concerns and Issues (Guba & Lincoln 1985 was undertaken throughout PCL, and MLTCs students were asked to evaluate how they were feeling at the end of each session. The rationale for undertaking this simpler type of evaluation was because of the short timescale of the module. Development of PCL students was evident, in relation to confidence, ability to apply theory to practice and group functioning. At the beginning of the module, students' comments reflect enthusiasm for the PBL process, '[groupworking] *helps me to learn effectively e.g. the way of thinking, researching and evaluating myself'; 'enhances our skills for working as an effective group/team.'* By the end of the module, students appeared pleased, *'We finally made it to the end and the group pulled together through hard work and teamwork'* and felt their thinking had been challenged, *'module made me think outside the box – pushed my level of knowledge*'. However, concerns were voiced at the beginning of the module around fear of participation. One student was concerned about her own ability to contribute, *'not being confident when talking in groups may appear to the group like lack of knowledge'.* Also, fear around participation of the whole group and the ability to research effectively during the process. By the end of the module, students' issues centred on how this learning could be translated into practice, *'How can I ensure I can use my skills developed in group work for the* future' and *'how can we ensure that we support each other after the group work has finished?'*

Adjectives used by students undertaking the MLTCs module described clear motivation at the beginning of the module, describing themselves as, *'enthused', 'enabled', 'excited'* and *'surprised'.* By the end of day two, although enthusiasm within the group was still evident, *'amazed', 'enlightened', 'informed'*, although some anxieties about the

process were beginning to show, *'phew'* and *'relieved'.* By the third day, students' level of anxiety about the process was clear, and feelings of being *'disjointed', 'overloaded'*, *'overwhelmed'* and *'being drained'* were described. On the fourth and last day however, students, in the main, reported feeling happy with their progress, describing their feelings as being '*motivated' and 'encouraged'*. One student said, *'things seemed clearer'*. However (36% n=4) described themselves as being *'apprehensive', 'stressed'* and remained, *'overwhelmed'*. After completion of the first case study, students said they felt there was a heavy workload, but they identified the positive group dynamics. One group member revealed that she had felt vulnerable on the first day, but going over expectations and identifying ground rules was helpful.

Discussion

Both student groups appeared to experience different levels of motivation and anxiety throughout the modules. Tutors made the assumption post-registration students would find this approach more challenging than pre-registration nurses who had previous experience of this teaching and learning approach. This was not the case. Within both groups, some students demonstrated some anxiety around participating within the group. Within PCL, this may have been due to a lack of clear expectations of module outcomes (Yeo 2005). Both groups reported they felt pressured by other academic commitments, but from the comments in the evaluation, the community nurses appeared more motivated. This finding is supported by Williams, MacDermit and Wessel (2003) who found masters-level physical therapy students adapted well to the process. Motivation may be better maintained in this module because of the short, four week duration or perhaps commitment to ongoing continuing professional development (Nursing and Midwifery Council, 2008). The pre-registration students appeared to lose motivation over the ten weeks of the module. Student motivation according to Yeo (2005) can be encouraged through curriculum design, endorsing the need to prioritise time to ensure appropriate design, in addition to clear communication of PBL objectives. The IBL process is also stressful for facilitators (Biley & Smith, 1999; Williams, MacDermit & Wessel 2003; Moffat, McConnaghie, Rss & Morrison 2004; Yeo 2005; Barman, Jaafar & Naing 2006; Smith & Coleman 2008). The literature has highlighted the importance of the process expertise of the facilitator, as well as subject expertise

(deGrave, Dolmans & Cees, 1999; Leung, Lue & Lee, 2003). What is clear is that the facilitator needs to be flexible in their approach (Heron, 1999).

It was beyond the scope of this study to measure improvements in critical thinking, problem-solving and conceptual understanding. This remains a key area of concern. However, students' marks were analysed in relation to marks achieved within other modules. Students undertaking PCL achieved higher grades in this module than the dissertation module, where they were supported in groups by facilitators but were self-directed. The MLTCs students' marks were poorer than those achieved by a previous cohort undertaking the same module using traditional teaching methods. It is not however possible to calculate statistical significance due to small student numbers - a limitation of this small educational initiative.

Conclusion

Inquiry-based teaching and learning approaches aims to address the needs of a modern, complex health service and fits with contemporary teaching and learning practice. Claims that it develops students' thinking and problem-solving ability, collaborative working and leadership are founded on a variable evidence-base. Clearly crucial to effective IBL is robust content and effective facilitation of the inquiry process, and the social interaction of the group. Effective facilitation needs to be flexible and enabling, but this can be challenging for tutors and students alike. Some students appear to find the process, particularly the middle of it, stressful and are reassured by the inclusion of more traditional methods offered through expert lectures. Clear communication of learning outcomes and the process of learning also helps. Post-registration students appear to find this teaching and learning approach motivating, perhaps due to their ability to usefully draw on their experiences from practice, or because participation in the group is more likely to be an active student choice. Conclusions cannot be drawn from this small study, but issues have been raised. These issues are backed up by the literature. However, questions remain around how to motivate students and the factors affecting student engagement with IBL. Future studies could broaden inquiry to include the facilitator's experience, improvements in the outcome of students' learning. Comparative studies across institutions, including

professional and non-professional groups, in the future may be feasible to broaden the debate around the strength of these teaching and learning approaches.

References

Albanese, M. 2000. Problem-based learning: why curricula are likely to show little effect on knowledge and clinical skills, *Medical Education.* 34, 729-738.

Baker, C.M., McDaniel, A.M., Pesut, D.J. & Fisher, M.L. (2007). Learning skills profiles of master's students in nursing administration: assessing the impact of problem-based learning. *Nursing Education Perspectives*, 28 (4), 190-195.

Barman, A., Jaafar, R. & Naing, N.N. (2006). Perception of students about the problem-based learning sessions conducted for medical and dental schools' students of Universiti Sains Malaysia. *Education for Health: Change in Learning & Practice*, 19 (3), 363-368.

Beers, G.W. (2005). The effect of teaching method on objective test scores: problem-based learning versus lecture. *Journal of Nursing Education*, 44 (7), 305-309.

Biley, F.C. & Smith, K.L. (1998). 'The buck stops here': accepting responsibility for learning and actions after graduation from a problem-based learning nursing education curriculum. *Journal of Advanced Nursing*, 27 (5), 1021-1029.

Biley, F.C. & Smith, K.L. (1999). Making sense of problem-based learning: the perceptions and experiences of undergraduate nursing students. *Journal of Advanced Nursing*, 30 (5), 1205-1212.

Bowman, D. & Hughes, P. (2006). Emotional responses of tutors and students in problem-based learning: lessons for staff development. *Medical Education,* 39*,* 145-153.

Connolly, C. & Seneque, M. (1999). Evaluating problem-based learning in a multilingual student population. *Medical Education*, 33 (10), 738-744.

Cranston. N (2008). The use of cases in the leadership development of principals. *Journal of Educational Administration,* 46, (5), 581-597

Dammers, J. Spencer, J. & Thomas, M. (2001). Using real patients in problem-based learning: students' comments on the value of using real, as opposed to paper cases, in a problem-based learning module in general practice. *Medical Education, 38,* 27-34.

de Grave, W.S., Dolmans, D.H.J. & Cees C.P.M .(1999). Profiles of effective tutors in problem-based learning: scaffolding student learning. *Medical Education*, 33, 901-906.

Dolmans, D.H.J.M, Wolfhagen, H.A.P., van der Vleuten, G.P.M & Wijnen, W.H.F.W.I , (2005). Solving problems with group work in problem-based learning: hold on to the philosophy. *Medical Education,* 35, 884-889.

Goelen, G., De Clercq, G., Huyghens, L. & Kerckhofs, E. (2006). Measuring the effect of interprofessional problem-based learning on the attitudes of undergraduate health care students. *Medical Education*, 40 (6), 555-561.

Guba, Y.S & Lincoln, E.G. (1985). *Naturalistic Inquiry*. Sage. Newbury Park, Calif. London

Heron, J. (1999). *The compete facilitator's handbook.* Kogan Page. London.

Johnson, D., Johnson, R. & Holubec, E. (1998). *Cooperation in the classroom*. Boston: Allyn and Bacon.

Kenny, N.P. & Beagan, B.L. (2004). The patient as text: a challenge for problem-based learning. *Medical Education,* 38, 1071-1079.

Kouzes, J.M. & Posner, B.Z (1997). *The leadership practices inventory (LPI) facilitator's guide*. Jossey-Bass/Pfeiffer

Leung, K. Lue B, & Lee, M. (2003). *Medical Education,* 37, 410-416

Lyons, E.M. (2008). Examining the effects of problem-based learning and NCLEX-RN scores on the critical thinking skills of associate degree nursing students in a southeastern community college. *International Journal of Nursing Education Scholarship*, 5 (1), 1-17

Magnussen, L., Ishida, D. & Itano, J . (2000). *Journal of Nursing Education,* 39 (8), 360-364.

Miller, S.K., (2003). Comparison of Student Outcomes Following Problem-Based Learning Instruction Versus Traditional Lecture Learning in a Graduate Pharmacology Course. *Journal of the American Academy of Nurse Practitioners*, *15 (12), 550-555.*

Moffat, K.J., McConnaghie, A., Rss, S. & Morrison, J.M. (2004). First year medical student stress and coping in a problem-based learning medical curriculum. *Medical Education,* 38, 482-491.

Nursing and Midwifery Council (2008). Standards of conduct, performance and ethics for nurses and midwives. Available at: http://www.nmc-uk.org/aDisplayDocument.aspx?documentID=5982 [retrieved 10th September 2009].

Nieminen, J., Sauri, P. & Lonka, K. (2005). On the relationship between group functioning and study Success in problem=based learning. *Medical Education,* 40 (1), 64-71

Pang, S.M.C., Wong, T.K.S., Dorcas, A., Lai, C.K.Y., Lee, R.L.T., Lee, W., Mok, E.S.B. & Wong, F.K. Y. (2002). Evaluating the use of developmental action inquiry in constructing a problem-based learning curriculum for pre-registration nursing education in Hong Kong: a student perspective. *Journal of Advanced Nursing*, 40 (2), 230-241.

Pederosa de Jesus, M.H., Almeida, P & Watts, M.I. (2004). Questioning styles and students learning: four case studies". *Educational Psychology,* 24 (4), 531-548.

Pederosa de Jesus, M.H., Teixeira-Dias, J.J. & Watts, M.I. (2006). Students' questions: building a bridge between Kolb's learning styles and approaches to learning. *Education and Training, 48, (23),* 97-111.

Schmidt, H., Vermeulen, L & van der Molen, H.T. (2006). *Medical Education,* 40, pp. 562-567.

Siu, H.M., Laschinger, H.K.S. & Vingilis, E. (2005). The effect of problem-based learning on nursing students' perceptions of empowerment. *Journal of Nursing Education*, 44 (10), 459-469.

Smith, L. & Coleman, V. (2008). Student nurse transition from traditional to problem-based learning. *Learning in Health & Social Care*, 7 (2), 114-123.

Smits, P.B.A., Verbeek, J.H.A. & de Buisonje, C.D. (2002). Problem based learning in continuing medical education: a review of controlled evaluation studies. *BMJ: British Medical Journal*, 324 (7330), 153-156.

Streichert, L.C., O'Carroll, P.W., Gordon, P.R., Stevermer, A.C., Turner, A.M. & Nicola, R.M. (2005) Using problem-based Learning as a strategy for cross-discipline emergency preparedness training. *Journal of Public Health Management & Practice,* (Nov Suppl S95-S99)

Thomas, J., Clarke, B, Pllard, K & Miers, M. (2007). Facilitating interprofessional enquiry-based learning: Dilemmas and strategies. *Journal of Interprofessional Care,* 21, (4), 463-465.

Tiwari, A., Lai, P., So, M. & Yuen, K. (2006). A comparison of the effects of problem-based learning and lecturing on the development of students' critical thinking. *Medical Education*, 40 (6), 547-554.

Van Berkel, H. J. & Dolmans, D. H. 2006. The influence of tutoring competencies on problems, group Functioning and student achievement in problem-based learning. Medical Education, 40 (8), 730-736

Valle, R., Petra, L., Marti¡nez-Gonzalez, A., Rojas-Ramirez, J. A., Morales-Lopez, S. & Pina-Garza, B. (1999). Assessment of student performance in problem-based learning tutorial sessions. *Medical Education, 33 (11),* 818-822.

Williams, B. (2001). Developing critical reflection for professional practice through problem-based learning. *Journal of Advanced Nursing, 34(1),* 27-33

Williams, R., MacDermit, J. & Wessel, J. (2003). Student adaptation to problem-based learning in an entry-level master's physical therapy program. *Physiotherapy Theory & Practice*, 19 (4), 199-212.

Yeo, R. (2005) . Problem-based learning: lesions for administrators, educators and learners. *International Journal of Educational Management. 19,(7).* .5401-551